

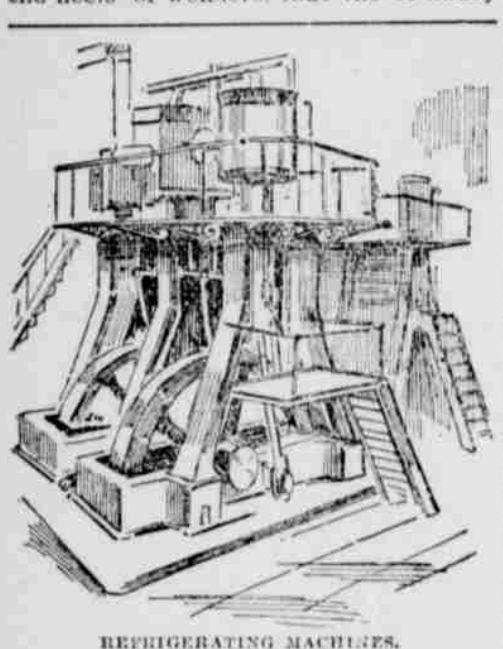
## ICE BY MACHINERY.

A NEW AND WONDERFUL INDUSTRY.

How Artificial Ice is Made by the Aid of Steam—The Different Methods Employed in Manufacturing It—Interesting Facts.

Ice made by steam: to reduce the temperature by the combustion of coal; to convert heat into cold, is a problem which modern science has solved, and that, too, in a practical way. Faradical as this statement appears, the most skeptical may be convinced of its absolute truth by inspecting any one of the three large manufacturing plants in Chicago where ice making and refrigerating machinery is constructed. After viewing the enormous engines there, possessing the strength of an hydraulic ram and the nicety of a chronometer, any remaining doubt as to their practicability will be dispelled by visiting the Van Buren streets, or any large packing-house or brewery, where acres of space are kept summer and winter, at a constant temperature but little above the freezing point, by the use of these very engines, and without consuming a single pound of ice.

In this century of unexampled progress, wonders have trod so closely upon the heels of wonders, that the ordinary



REFRIGERATING MACHINES.

layman in the world of science has been unable to keep pace with them, or fully comprehend the principles underlying many of the great inventions which have revolutionized economies, and largely contributed to the comforts of his own life. Very few have a comprehensive idea of ice-making machinery, though the matter is one susceptible of lucid demonstration.

At a temperature of 32 degrees Fahrenheit water congeals and becomes ice. To the schoolboy, yearning to try his cherished skates, and the leeman eager to begin the harvest of his crop, this process appears a very slow one. It would seem, indeed, that water, reduced to a temperature below the freezing point, ought almost instantly to take on a crystalline form, and change en masse from a fluid to a solid. For lack of better terms we speak of nature as possessed of likes and dislikes; loving this and abhorring that. In this sense matter seems both to change its state and take on another and different condition. Were it not for this change would be the rule; nothing would be stable; chaos would reign. That water does not freeze more rapidly is due to the presence in it of latent heat, which must be expelled before the change can take place. Latent heat is as mysterious an affair as electricity. In no way can it affect the senses; the most delicate thermometer will not indicate its presence, yet it is none the less certain that it exists and in never varying quantities. To illustrate this, place a block of ice at a temperature of 32 degrees in a kettle over a brisk fire. When it is entirely melted the resulting water will be but little raised in temperature from that of the ice. Faraday determined that to melt a cubic yard of ice, about 1,500 pounds, without raising the temperature, requires seventy pounds of coal.

It was known to the people of ancient Rome that wet clothing becomes rapidly and powerfully chilled, yet not one of all her philosophers saw in the circumstance a suggestion for manufacturing ice to cool the wine and sherbet of royalty. In lieu of the snow brought from the tops of mountains. This was left to Dr. Joseph Black, the Scotch-Irish chemist of Edinburgh, who, about 1760, who formulated and made public his famous theory of latent heat. He found that to convert one pound of water at 212 degrees into steam, at the same temperature, requires six and one-half times the heat necessary to raise the same amount of water from 62 to 212 degrees. In other words, if one pound of steam at 212 degrees is mixed with six and one-half pounds of water at 62 degrees, there will result seven and one-half pounds of boiling water. It was at once evident that if, of six and one-half pounds of water at 62 degrees, one-half pound could be suddenly converted into steam, the remaining six pounds would be frozen. The problem was, how to effect this.

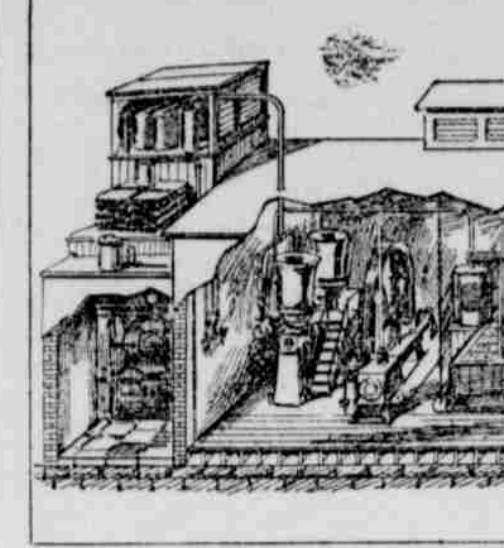
If any elastic fluid, atmospheric air, for instance, is compressed, it becomes heated, and if cooled down to its original temperature, the same heat must be restored in the process of expansion to its normal condition. This heat is withdrawn from the atmosphere or other surrounding substance, thus reducing the temperature. By the expansion of liquid sulphuric acid or solidified carbonic acid, water can be frozen in a root dish, and a small quantity added to a glass of boiling water will almost instantly convert it into solid ice. It is upon this principle of latent heat that ice-making machinery depends.

The original or "ground" patents for lowering the temperature by machinery expired some years ago, and are now common property. In consequence of this, vast numbers of ice-making manufacturing plants have sprung up all over the civilized world, more than fifty being located in the United States alone. Every manufacturer has its own special patents, and the number of different forms of machines on the market is hence very large. They may, however, all be reduced to two distinct varieties—ether and ammonia machines.

Ether machines include all those where cold is produced by the evaporation of a volatile liquid. They include

the apparatus which employ sulphuric ether, gasoline, chymogene and other derivatives of petroleum. The liquid is evaporated in a partial vacuum, by means of which the process is greatly facilitated. Having absorbed heat in the process the gas is condensed and used over and over.

Ammonia machines differ from those using ether principally in this: that no



MODEL ICE PLANT.

air-pumps are required to produce a partial vacuum and draw off the vapor, and that enormous pressure is necessary to condense the ammonia into fluid form. In ether machines the power is principally employed in aiding evaporation; while in ammonia machines it is used on the compression of the gas. The reason of this is found in the different natures of the two materials employed. Ether is, in its normal condition, an exceedingly volatile liquid, while ammonia is a gas having but little more than half the weight of atmospheric air. Like all gases, ammonia can be compressed to a liquid, and it is in this form that it is introduced into an ice machine. Ether machines are decidedly passé in this country, though they are still used to some extent in Europe; as likewise are air machines, particularly in England. The latter are fast giving place to ammonia machines, being operated on the same general principle of expansion.

A description of the construction and modus operandi of an ammonia machine will convey an intelligent idea of how ice is made by steam.

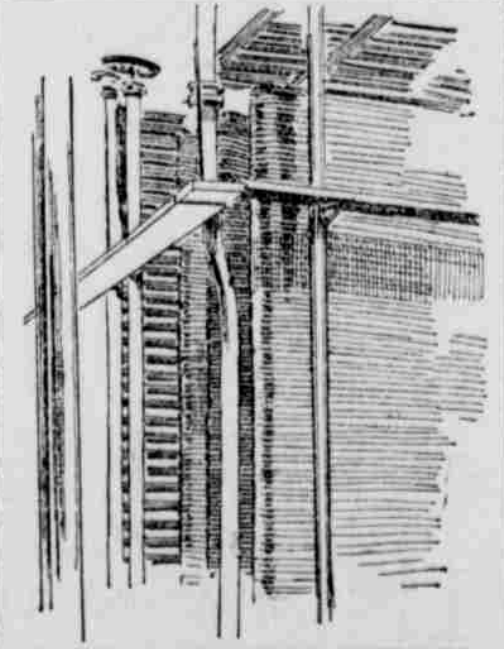
Every such apparatus consists of three parts: (1) An engine and ammonia pumps, by means of which the gas is placed under a liquefying pressure; (2) a condenser, in which the compressed gas, heated by the process of compression, is cooled and so changed into a liquid form; (3) a system of evaporating coils, in which the liquid ammonia is expanded into a gaseous state and then cools the surrounding space, when used as a refrigerator, or brine when employed in making ice.

Liquid ammonia is prepared by manufacturing chemists, and is furnished in heavy iron drums to guard against the danger of explosion. It is allowed to enter the evaporating coils, and, having been fully expanded, enters the compression

pumps and is fairly started on its circuit.

What the heart is to the human body the compression pumps are to the ammonia machines, and it is here that the greatest strength must be combined with the finest possible finish. The compressor must be able to withstand a pressure of more than three hundred pounds to the square inch, while the piston must fit so tightly and perfectly that not even the subtle gas can find a leak, and at the same time occasion no great amount of friction. It is in the construction of the apparatus that the greatest amount of ingenuity has been exercised.

Another very important matter is the

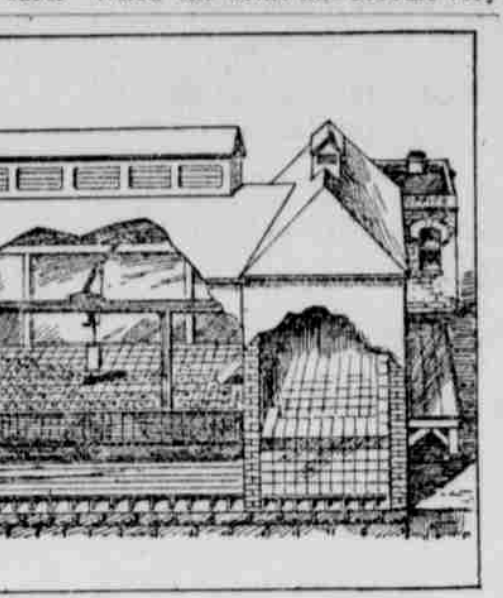


PORTION OF ATMOSPHERIC CONDENSERS.

cooling apparatus by which the compressed gas is reduced in temperature until it assumes a liquid form. Where water can be cheaply attained, it is generally employed alone, the gas being allowed to circulate through it in metal coils. Where water is scarce, however, or of rather a high temperature, open piles of coils are erected in the open air, and a large amount of the heat thus disposed of. To facilitate this, water is allowed to drip over the coils, and by its low temperature, and the fact that it

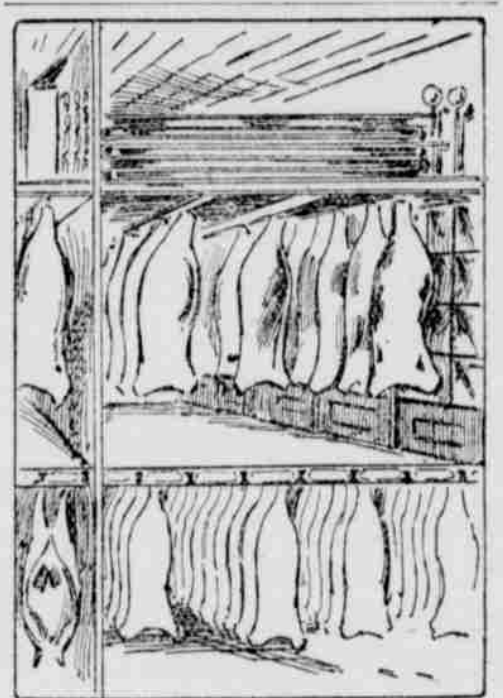
largely evaporates, greatly aids the process.

The method thus described is called the "direct expansion" process. "Brine system" is the same, except that the expanding gas is confined to coils which are submerged in brine—i. e., a strong solution of salt, which will not congeal unless at a very low temperature. When the brine has become very



VIEW OF CHILL-ROOMS.

cold it is forced in pipes through the rooms to be cooled. Both systems are used and have their advocates. The direct expansion plan is probably the most economical, but in the very possible event of a leak the contents of the cold storage or cooling rooms might be ruined. Besides the anhydrous or liquid form, ammonia is also used in a saturated so-



VIEW OF CHILL-ROOMS.

lution. Water has a powerful affinity for ammonia, appropriating as much as 720 times its own bulk of the gas. Aqueous ammonia is introduced and expanded, and the same results obtained as by the other system. It is, however, an inferior method, rapidly falling into disuse, and need not be described in detail.



INVENTIONS MAKE STRANGE COMBINATIONS.

An ice machine in operation is a curious spectacle. Liquid ammonia begins to expand at a temperature of forty degrees below zero, and in consequence of this intense cold the large iron pipes in which it takes place are, on the hottest days of summer, covered with solid frost, and appear to be coated with a snow-white enamel. Some machines leak ammonia badly and thus produce a most disagreeable odor. This waste is quite an important matter from a financial standpoint, since anhydrous ammonia costs in the neighborhood of fifty cents a pound.

In making ice the same machine is used as in refrigerating. The ammonia is allowed to expand in coils which are submerged in brine. The tanks holding the brine are shallow, and present a large surface. Into these are immersed tin molds or cans, containing the water to be frozen. These vary in size according to the ice-producing capacity of the machine. They are usually two feet or more in length and from eight to eleven by twenty-two inches in breadth and depth. Slow freezing makes clear ice, and twenty-four hours is usually employed in congealing the contents of the molds. Sometimes these are all emptied at once, but more generally this is done singly, and at such intervals of time as to complete the circuit every twenty-four hours, the cans being refilled with water as fast as the ice is withdrawn. The better class of machines use distilled water, thus insuring the purest sort of ice. This is obtained by condensing the exhaust steam from the engines. Ice-making machines vary in producing capacity from one to one hundred tons in twenty-four hours. A ton of coal will produce, in machines of large capacity, seven tons of ice.

Artificial ice is clear as crystal, and being uniformly frozen and free from air bubbles, is not only of the most wholesome sort, but has greater lasting properties than the natural product. It is claimed to have been demonstrated from actual experiments that manufactured ice requires, under the same conditions, 10 per cent more time to melt than does that naturally frozen.

Just now the demand for ice machinery largely exceeds the producing capacity of all the factories in the coun-

try. This is no doubt largely due to the mildness of the past winter and the consequent shortness of the ice crop; but ice-making is largely on the increase, and in time will drive the natural product from the market, except, perhaps, in the extreme northern portion of the country. In Chicago refrigerating machinery has been found not only more convenient, but much cheaper than ice, and is employed by the greater part of the breweries, packing-houses and cold-storage establishments. It is claimed that ice can be made in Chicago for 90 cents a ton, which is doubtless much less than the cost of the natural article in ordinary seasons, storage, transportation, extra handling and waste being taken into account. If this estimate proves to be correct, steam-made ice will soon be almost universally used in this city.

The Germans have gone deeper into the science of making artificial ice than any other nation. They have technically exhausted the subject, but are a long way behind the United States in the character and practical operation of the machines actually in use.

Chicago, who counts herself as nothing if not in the lead, is sending cold-producing machinery to all parts of the Union and to South America, where she successfully competes with European machines. The industry is new, but will assume, and that in the near future, vast proportions, enabling people of very moderate circumstances to use ice, and that in the summer as well as winter season.

DWIGHT BALDWIN.

**Lunch and Dining.**  
Dining and luncheon one's friends have always been and will remain the favorite method of entertainment. As Owen Meredith says, "We may live without friends, we may live without books, but civilized men cannot live without cooks."

Sir Joshua Reynolds was a great dinner giver, but in his dinings belonged none of the daintiness of arrangement and attention to detail so essential nowadays. That wonderful artist believed in gathering about his board men whose tastes and vocations were to a degree compatible. Nor was that a mistaken basis upon which to build a successful dinner. To-day the appearance of the table is a question of great importance, and were the bouillon weak and tasteless mine host would soon forget it, provided the butler had had the forethought to serve it in dainty Dresden cups or egg-like shells of Sevres.

A very pretty luncheon table, and an inexpensive one, is formed by abandoning the table cover altogether and using the unclotted table in all the glory of its polished surface. A square of fringed linen embroidered in dainty silks is the centerpiece, with a jardiniere filled with ferns or flowers standing in the middle of the table. Smaller squares of linen, embroidered in the same design, are placed under each plate, relieving the hard effect of the wood. The custom of laying a small bouquet, and oftentimes but a single rose, by the plate of each guest, is a pretty one, and not an extravagant one, either. The napkins should be embroidered with monograms and placed at the right of the plate, with a long roll folded in each. The desired number of knives must be on the right and the forks on the left.

The custom of serving one's edibles from the table is quite a thing of the past, and now everything is served from a side-table or buffet, or brought in from the butler's pantry. A silver or cut-glass dish of olives is sometimes used as one of the ornaments of the table, and an exquisite dish for bouillons is left standing throughout the twelve or thirteen courses, for the lunch or breakfast of to-day is not unlike a dinner, and is fully as elaborate in preparation.

Found a Very Old Sword.

A rare archaeological treasure was unearthed at Dubuque, Iowa. Henry Wagner, an old gentleman living in Heeh's Hollow, in the northern part of the city, was digging in his garden when his spade turned over the blade of a rusty sword lying about two feet below the surface. When the rust and dirt which thickly incrustated the blade was carefully removed, numerous inscriptions became visible. On one side near the hilt is an ornamental scroll bearing the date 1580; above is the figure of a bound leaping; still further up the blade is engraved a mailed hand holding a sword. On the reverse is a suit of armor with lances and crossed swords, and above it a papal mitre. Over the entire blade runs delicately engraved scroll work, which is now only faintly visible. Local archaeologists think the sword a relic of the early French explorers who first visited the valley of the Mississippi.

In Darkest Africa.



He—Now, no foolin'! Ef yo' don stop drinkin', ouah maternal protection stops short off, heah!

She—Gloog, dar, yo' brack fool! What yo' smells on my bief is on'y dat sailor we had fob breakfast!

UNDER an old law making it illegal to shoot at night, a sportsman recently arrested in Paris for unlawful killing of game drew from the courts a legal definition of the day's end. It was decided that night began with the close of twilight, or when the sun had descended six degrees below the horizon.

## HUMOR.

No Need to Interfere.  
Excited lady—Why don't you interfere to stop that dog fight?  
Bystander—I was just a goin' to, mum; but you kin calm y'r fears now. My dog is on top at last, mum.—*Street & Smith's Good News.*

Was on His Mind.  
"I want to ask you a question, Katy," he said, shortly before taking his departure. "It has been on my mind all the evening, but I—I—"  
"Well, what, Mr. Dingdong?" asked Katy, encouragingly, her heart throbbing with expectancy. "Speak right out."  
"Well, Katy, will you be—I wanted to ask if you would be kind enough to find out if the dog is chained to-night."

The Wind Shifted.



Light.  
Lit.  
Lighter.  
Couldn't Help Herself.  
Watts—So she refused you, did she?  
Dumley—Yes; said she wouldn't even be a sister to me. That made me mad, and now she's got to be one to me.  
Watts—How is that?  
Dumley—I proposed to her sister and was accepted.

He Got His Dollar.

A strapping young man sat in the Erie depot, across the Hudson, the other day, waiting for his train. He had twelve scythe-stones in a bundle on his right hand, and a cuckoo clock in a box on his left. As he was looking around the waiting-room he gave a sudden start. Then he started some more. Then he rose up and walked over to a flashily dressed man about forty years old, whom anyone would have spotted as a fakir, and asked:  
"Don't you travel around with a tooth-powder?"  
"No, sir," was the sharp reply.  
"Wasn't you up in Elizabeth last fall?"  
"No, sir."  
"Yes, you was, and I'll bet on it. You are the same durned feller, and I know it!"  
"Sir! What does this mean?" demanded the other.  
"It means that I was in Elizabeth last fall and bought a box of your tooth powder. You changed a five-dollar bill, and darn my hide if you didn't hornswaggle me out of a dollar!"  
"Sir!"  
"No use, old fellow! I knowed yo the minit I got eyes on ye. Same big diamond pin—same red neck-tie—same, nose, humped up in the middle like a circus camel! I want that dollar!"  
"This is outrageous! I'll call a policeman!" shouted the fakir.  
"Call and be durned to ye, but I'll Nek ye first! You either come down with that dollar or I'll wallop ye till ye can't holler!"  
"Look here!" replied the other in much milder tones, "you are mistaken. It was my cousin who was in Elizabeth. He is dead now."  
"Then I'll take it out of you!"  
"He is dead, as I remarked, and rather than have any blot resting on his fair escutcheon I will pay you the dollar."

"That's all right! I don't know anything about 'scutcheons, but I've got to have that dollar or pull hair! I've bin lookin' for that hump-backed nose all over the face of the earth. And I've laid awake nights thinkin' how I'd make ye holler like an Injun if ever I got my paws on ye!"  
He was given the dollar, and the fakir disappeared at once, and the young man explained to those about him:  
"I'm almost sorry he gave up so soon. I was just achin' clean down to my toes to lick him all over a forty-acre lot!"—*New York World.*

SOME one has calculated the world's present stock of champagnes at 110, 250,000 bottles.

THAT which fewest persons can do, the greatest number try to do.

WALKING the plank is not the same as making a board walk.

**Important Trade Name Decision.**  
Judge Thayer, of the United States Circuit Court at St. Louis, has recently handed down an opinion and granted a perpetual injunction against the defendants in the case of the Hostetter Company against the Bruggeman Reibert Distilling Company, alias Gold Spring Distilling Company, prohibiting the advertising, manufacturing or selling of any article of stomach bitters either in bulk, by the gallon or otherwise, or in any way making use of the name "Hostetter," except in connection with the sale of the genuine bitters, which are always sold in bottles securely sealed, and also prohibiting the sale of any bitters in bulk, though the name "Hostetter" be not used, but the suggestion made to the purchaser that he can put them in the empty Hostetter bottles and purchasers would not discover the difference. His decision supports the Hostetter Company in the extensive use of the name "Hostetter" in connection with either the manufacture or sale of stomach bitters in any manner or form whatsoever, and firmly establishes its ownership in the same as a trade name.

A Remarkable Stone.

There is a large stone taken from a colliery drain, and is remarkable in that it constitutes a perfect calendar of Sundays and holidays. The stone is composed of carbonate of lime. When the miners were at work, the water running through the drain left a deposit colored black by coal dust; but, when they were not at work, the water ran down clear and left a white deposit. In time these black and white layers made a stone of considerable thickness, which constitutes quite a calendar. Each day of work has left a black streak, which is followed by a white streak during the night, while white streaks mark the Sundays and other holidays, and from this circumstance the stone is called "The Sunday Stone."

A SAD and a JOYOUS SCENE.—If there is anything under the sun that will make an angel round the eyes it is to see a near-sighted bachelor trying to thread a needle. One of the most joyous scenes is to witness the rejoicing of the little family over the recovery of father or mother who has been restored to health by the use of Dr. White's Dandelion after the doctor had said there was no hope for recovery. Such scenes are of frequent occurrence where this medicine is used.

EDWARD WAKEFIELD, in his History of New Zealand, estimates that the introduction of bumble-bees has already profited the farmers to the extent of \$5,000,000. Before their introduction it was impossible to grow red clover seed for lack of fertilizing agents.

THERE is a Wall-street suspicion that when the whale swallowed Jonah he was manipulating an inside deal in futures on watered stock.

THAT "wall gone" or faint feeling so prevalent with our best female population quickly succumbs to the wonderful powers of Lydia E. Pinkham's Vegetable Compound. It never fails.

THE foolish things you did when you were young are always in pursuit of you.

No Optum in Piso's Cure for Consumption. Cures where other remedies fail. 25c.

A GREAT deal that is called love, is curiosity to find out what love is like.

## Weak and Weary

In early summer the warmer weather is especially weakening and enervating, and "that tired feeling" is very prevalent. The great benefit which people at this season derive from Hood's Sarsaparilla proves that this medicine "makes the weak strong." It does not act like a stimulant, imparting fictitious strength, but Hood's Sarsaparilla builds up in a perfectly natural way all the weakened parts, purifies the blood, creates a good appetite.

**Hood's Sarsaparilla**

Sold by all druggists, \$1; six for \$5. Prepared only by C. I. HOOD & CO., Lowell, Mass.

100 Doses One Dollar

**FOR OLD AND YOUNG.**  
Tutt's Liver Pills act as kindly on the child, the delicate female or infirm old age, as upon the vigorous man.

**Tutt's Pills**

give tone and strength to the weak stomach, bowels, kidneys and bladder.



Perfected by Druggists & Fancy Goods Dealers Everywhere

**DONALD KENNEDY**

Of Roxbury, Mass., says

Kennedy's Medical Discovery cures Horrid Old Sores, Deep Seated Ulcers of 40 years' standing, Inward Tumors, and every disease of the skin, except Thunder, Humor, and Cancer that has taken root. Price \$1.50. Sold by every Druggist in the U. S. and Canada.

The Soap that Cleans Most is Lenox.